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Zhao et al.

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(54) **ELECTRICAL CONNECTOR HAVING IMPROVED TONGUE PORTION**

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Jun. 13, 2013 (CN) 2013 2 0312504

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H01R 13/6596	(2011.01)
H01R 12/72	(2011.01)
H01R 13/6594	(2011.01)
H01R 13/6593	(2011.01)

(52) **U.S. Cl.**

CPC ***H01R 13/405*** (2013.01); ***H01R 13/6581*** (2013.01); ***H01R 13/6596*** (2013.01); *H01R 12/724* (2013.01); *H01R 13/6593* (2013.01); *H01R 13/6594* (2013.01)

(58) **Field of Classification Search**

CPC H01R 13/65802; H01R 13/6581; H01R 13/6593; H01R 13/6594; H01R 12/724
USPC 439/607.58, 607.55, 607.35, 660
See application file for complete search history.

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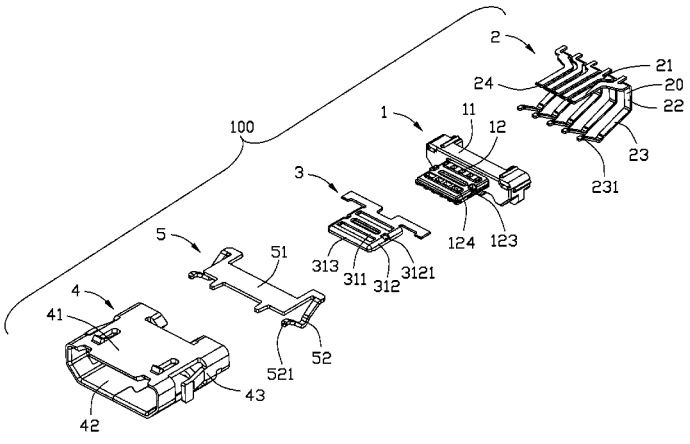
(57) **ABSTRACT**

An electrical connector (**100**) includes an insulative housing (**1**), a number of terminals (**2**) mounted to the housing and including a pair of outermost terminals, and a stiffener (**3**) attached to the housing and defining a pair of openings. The insulative housing includes a tongue portion (**12**) defining a number of passageways (**121**), a pair of first indentations (**123**) each opened upwardly and extending through an upper portion and a side portion of the tongue portion. The outermost terminal (**20**) has an upper surface and a side surface partly exposed outwardly via the first indentation and the opening. Also disclosed is a compression mounted electrical connector including a shell and a grounding member secured to the shell and similarly configured as terminals thereof.

16 Claims, 10 Drawing Sheets



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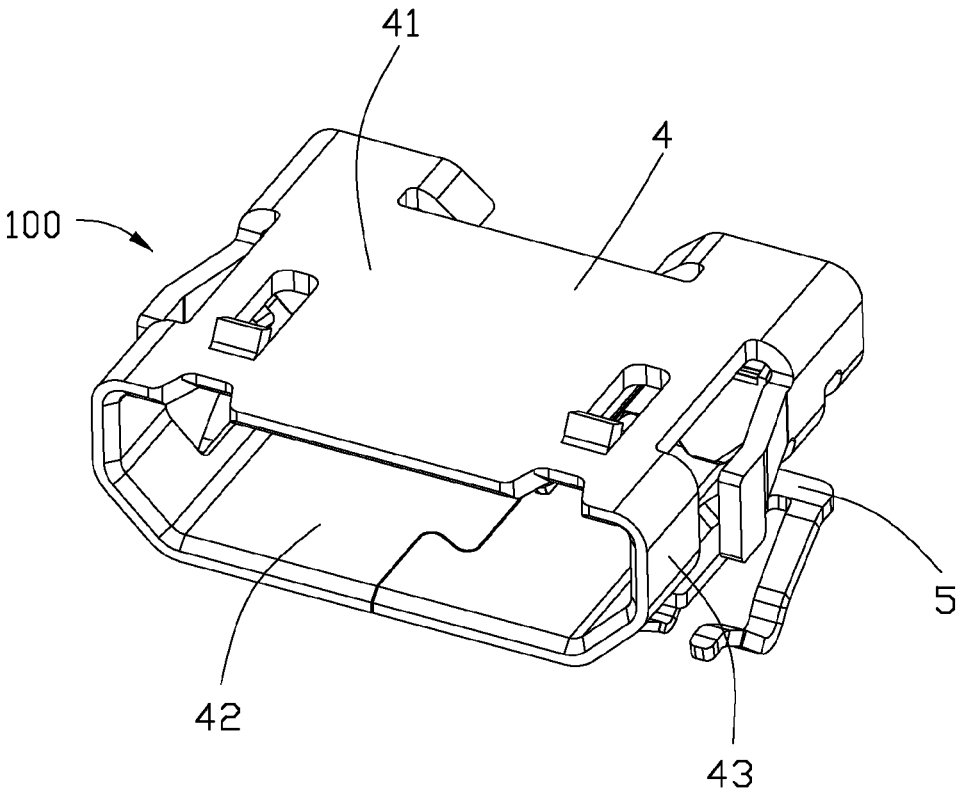

FIG. 1

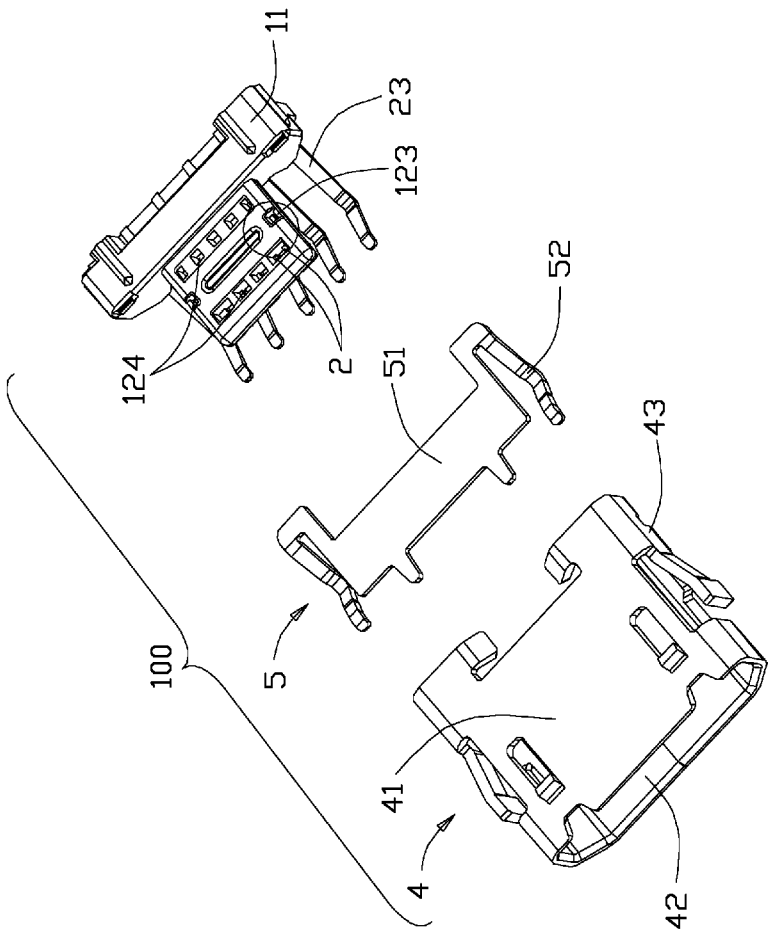

FIG. 2

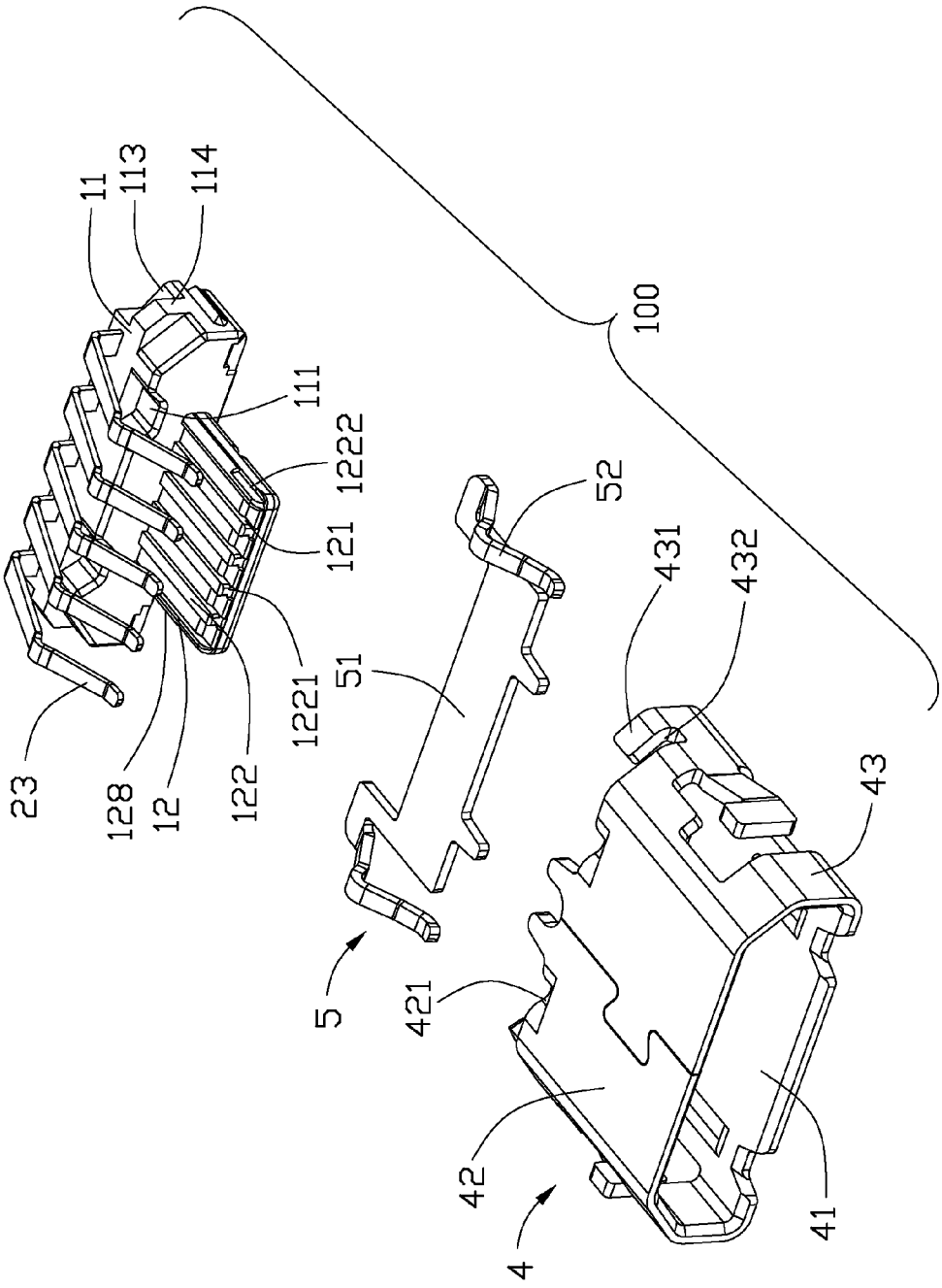
100
11
113
114
111
1222
121
1221
122
12
128
23
51
52
5
421
431
432
43
42
41
4

FIG. 3

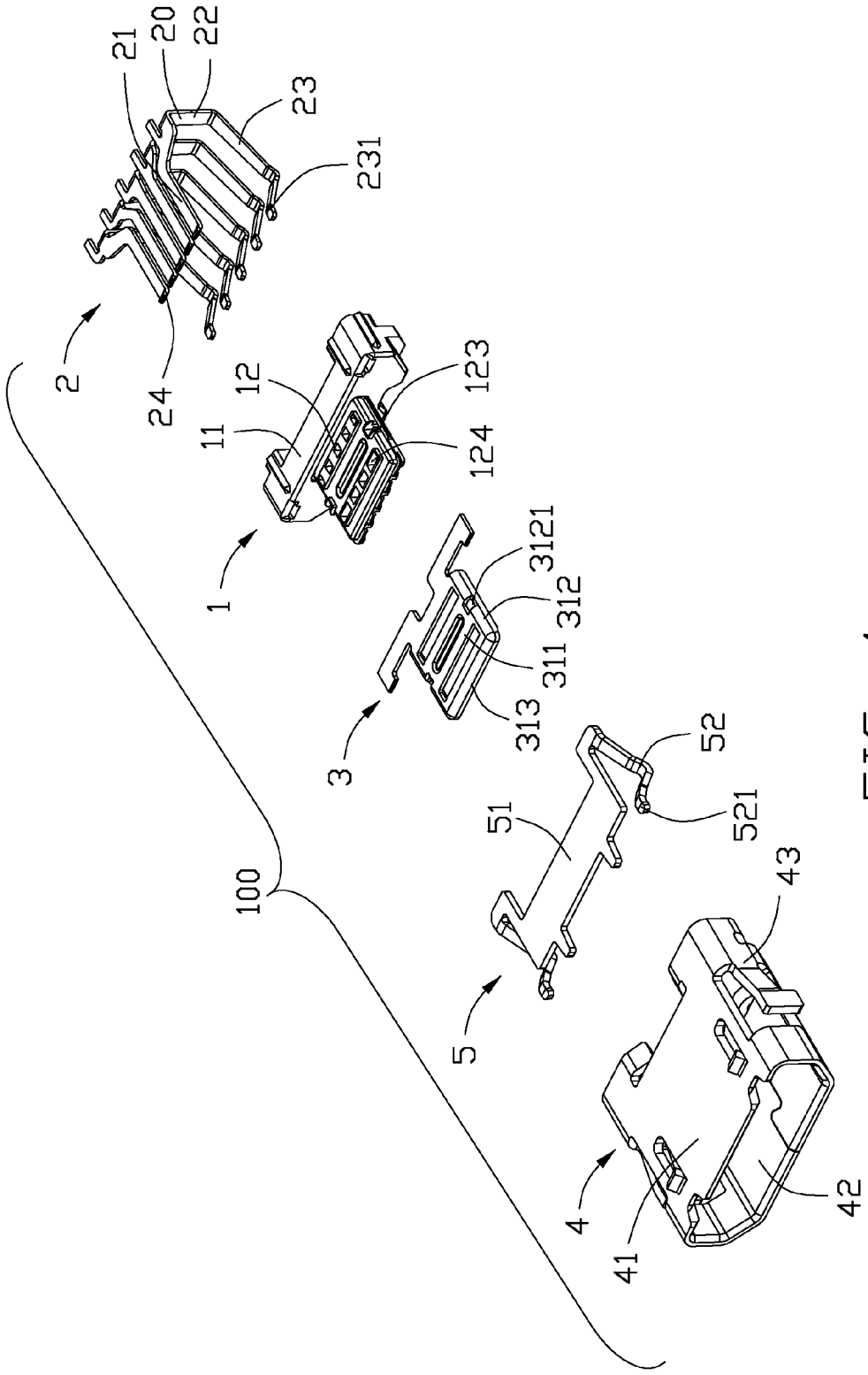
21
20
22
23
231
2
24
12
123
11
124
1
3121
312
311
313
3
52
51
521
5
43
100
4
41
42

FIG. 4

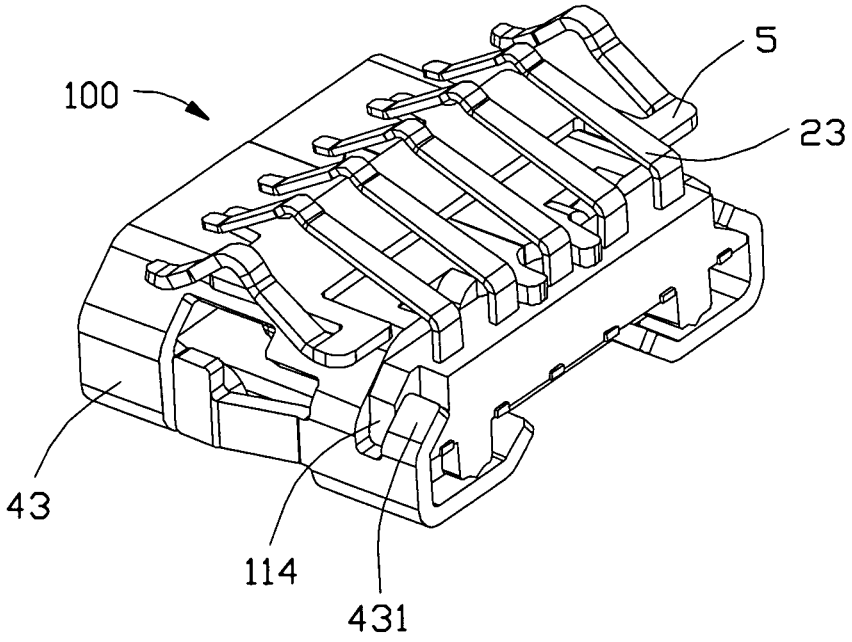

FIG. 5

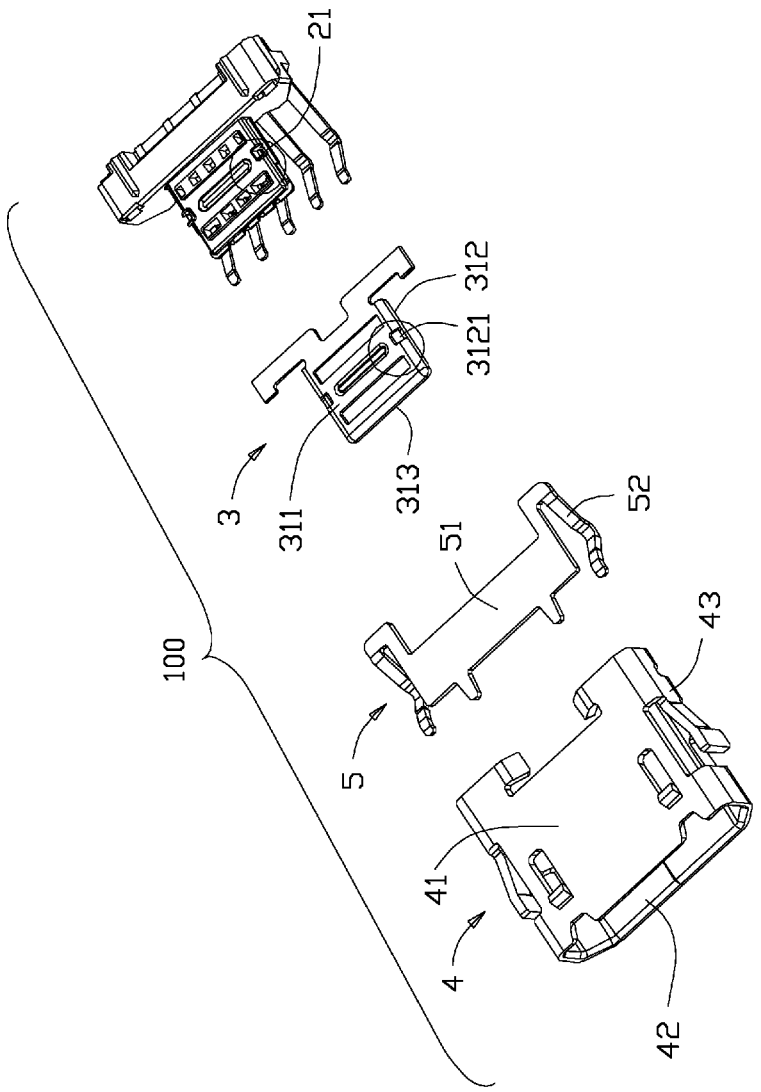

FIG. 6

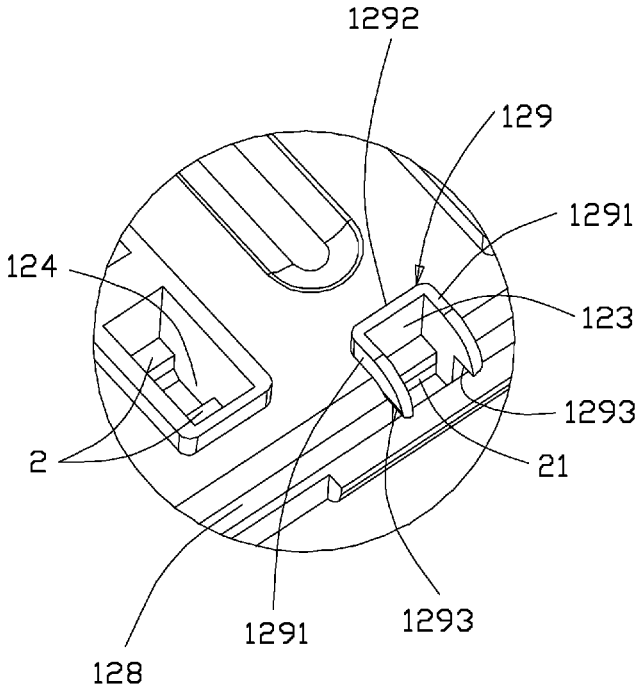

FIG. 7

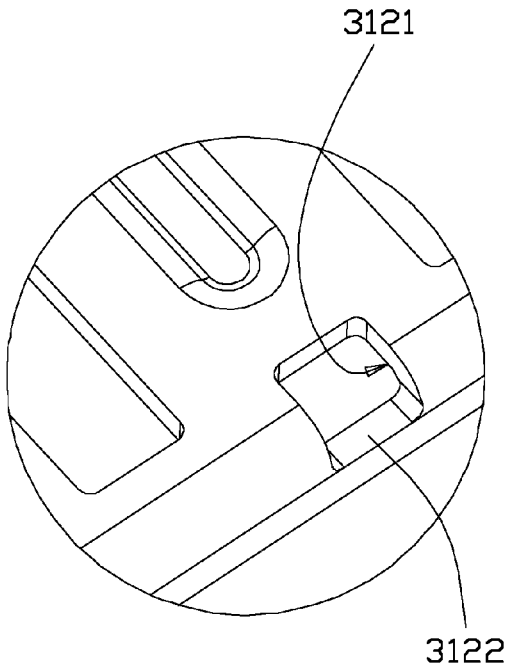

FIG. 7A

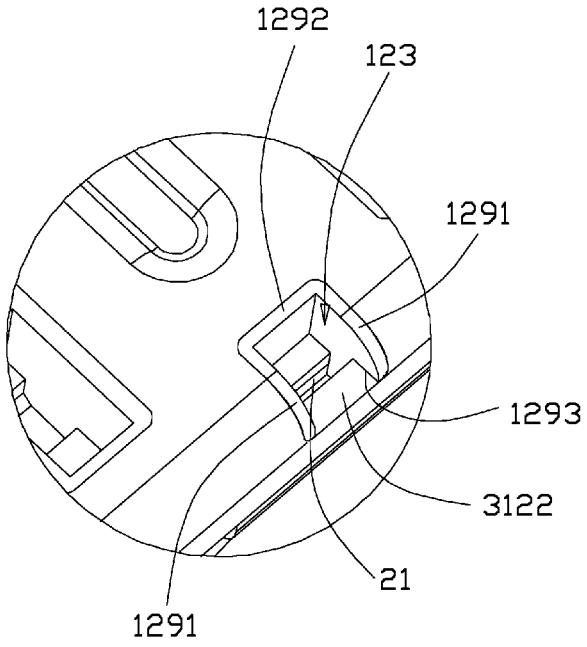

FIG. 7B

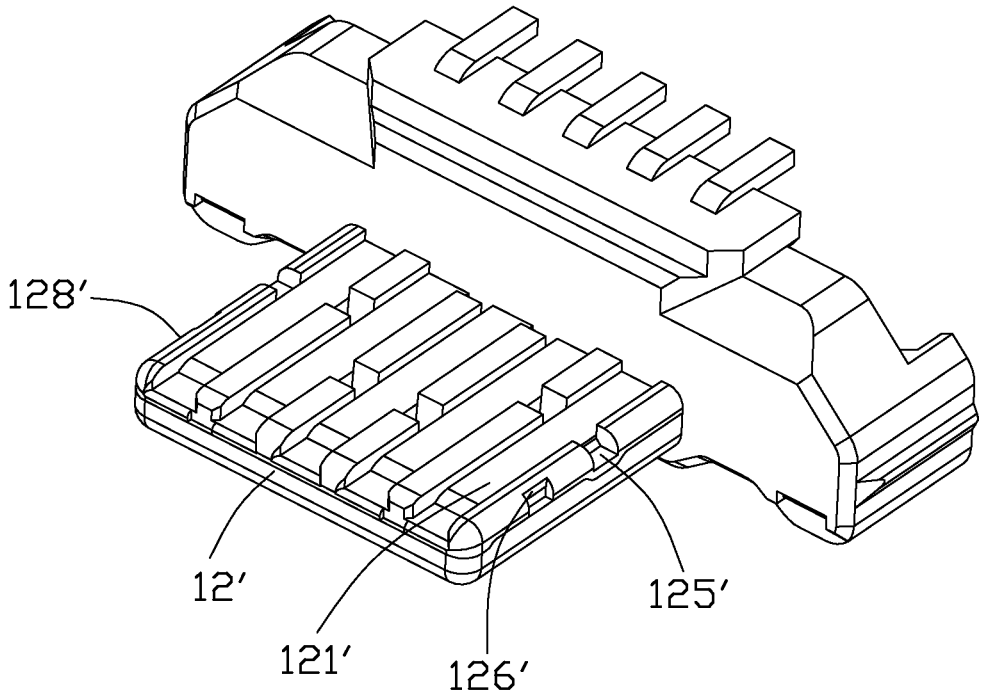

FIG. 8

ELECTRICAL CONNECTOR HAVING IMPROVED TONGUE PORTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electrical connector, and more particularly to a micro USB (Universal Serial Bus) connector that positions its terminals precisely for preventing short circuit or fire breakout. The present invention also relates to a compression mount electrical connector including a shell and a specially designed grounding member secured to the shell and similarly configured as terminals thereof.

2. Description of Related Art

China Utility Patent No. 201904481 issued on Jul. 20, 2011 discloses a micro USB connector including an insulative housing having a base portion and a tongue portion extending from the base portion, a plurality of contacts affixed to the insulative housing, a stiffener having a pair of side portions attached to the tongue portion, and a shell shielding the insulative housing. The tongue portion defines a plurality of channels on a lower surface thereof for receiving the contacts and a plurality of holes on an upper surface thereof for positioning modules. The two outermost terminals neighboring side portions of the stiffener, if not properly positioned during manufacturing, may be too close to the metal stiffener as to cause short circuit or fire breakout.

U.S. Publication No. 2014/0065889, published on Mar. 6, 2014, discloses a micro USB connector including an insulative housing having a base portion and a tongue portion, and a plurality of terminals. The tongue portion has a plurality of ribs on a lower surface thereof and a plurality of passageways alternating with the ribs. Each rib has an indentation opened downwardly accommodating a mold. The indentation is defined at the lower surface of the tongue portion such that it is not feasible to provide a stiffener at an upper portion of the tongue portion because the mold may not be used for positioning the stiffener through the indentation.

A micro USB connector having an improved tongue portion is desired.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide an electrical connector comprising: an insulative housing including a base portion and a tongue portion extending forwardly from the base portion, said tongue portion having an upper portion, a lower portion, a pair of side portions, and a plurality of passageways at the lower portion, said tongue portion defining a pair of first indentations each exposing upwardly and through the upper portion and the side portion for accommodating a first mold; a plurality of terminals including a pair of outermost terminals, each terminal having a body portion secured in the passageway of the insulative housing; and a stiffener attached to the upper portion of the tongue portion and defining a pair of openings aligned with the first indentations respectively, said body portion of each outermost terminal having an upper surface and a side surface for being resisted against by the first mold, the upper surface and the side surface of the outermost terminal body portion partly exposed outwardly via the first indentation and the opening after removal of the first mold.

The terminals and the stiffener may be confined at predetermined positions precisely by the first mold through the first indentation. The outermost terminal is resisted to keep a certain distance away from a side wall of the stiffener by the first mold. Therefore, short circuit or fire breaking out caused by the outermost terminal and the stiffener is prevented.

Another object of the present invention is to provide an electrical connector comprising: an insulative housing including a base portion and a tongue portion extending forwardly from the base portion; a plurality of terminals each having a contact portion, a body portion secured in the tongue portion, a substantially V-shaped compressible tail portion, and a connecting portion between the tail portion and the body portion, said tail portion disposed below the insulative housing and facing to the body portion for compression mount to a printed circuit board; a shell including a top wall, a bottom wall, and a pair of side walls and shielding the insulative housing; and a grounding member comprising a primary plate secured to the bottom wall of the shell and a pair of resisting portions disposed at two opposite sides of the primary plate, each resisting portion having a configuration substantially same to that of the tail portion for being compression mount to the printed circuit board.

Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an assembled perspective view showing an electrical connector in accordance with a first embodiment of the present invention;

FIG. **2** is a partly exploded perspective view showing the electrical connector shown in FIG. **1**, with a stiffener attached to an insulative housing together with terminals;

FIG. **3** is another partly exploded view similar to FIG. **2**, taken from another aspect;

FIG. **4** is an exploded view showing the electrical connector shown in FIG. **2**;

FIG. **5** is another assembled view similar to FIG. **1**, taken from another aspect;

FIG. **6** is a partly exploded view showing the electrical connector, with the terminals integrated to the insulative housing;

FIG. **7** is an enlarged view showing a part of the tongue portion marked in FIG. **6**;

FIG. **7**(A) is an enlarged view showing a part of the stiffener marked in FIG. **6**;

FIG. **7**(B) is an enlarged view showing a part of the assembled tongue portion and stiffener marked in FIG. **2**; and

FIG. **8** is a perspective view showing an insulative housing referred in a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiment of the present invention. Referring to FIGS. **1-6**, an electrical connector **100** in a first embodiment comprises an insulative housing **1** including a base portion **11** and a tongue portion **12** extending forwardly from the base portion **11**, a plurality of terminals **2** integrated with the insulative housing **1** in an insert molding process, a stiffener

3 attached to the tongue portion **12**, a shell **4** shielding the insulative housing **1** and a grounding member **5** attached to the shell **4**.

Referring to FIG. **3**, the base portion **11** defines a pair of cutouts **111** at a lower side thereof, a pair of protrusions **114** formed at opposite sides thereof, and a concave **113** behind each protrusion **114**.

Referring to FIGS. **3** and **4**, the tongue portion **12** has an upper portion, a lower portion, a pair of side portions, a pair of flanges **128** formed at opposite sides of the lower portion, a plurality of passageways **121** defined between the pair of flanges **128**, and a plurality of ribs **122** alternating with the plurality of passageways **121**.

In conjunction with FIG. **7**, the tongue portion **12** defines a first indentation **123** opened upwardly and extending through the upper portion and the side portion of the tongue portion **12** accommodating a first mold (not shown) which is used to resist against the terminals **2** in the insert molding process. The upper portion of tongue portion **12** defines a plurality of second indentations **124** staggered with the passageways **121** communicating with a plurality of substantially T-shaped second molds (not shown) which are used to resist against the terminals **2** in the insert molding process. Each flange **128** defines a first recess **1222** accommodating a fourth mold (not shown) confining the terminals **2** in the insert molding process. Each rib **122** has a front end retreated backwardly to form a second recess **1221** accommodating a fifth mold (not shown) confining the terminals **2** in the insert molding process.

In conjunction with FIG. **4**, the plurality of terminals **2** include a pair of outermost terminals **20**. Each terminal **2** includes a horizontal body portion **21**, a contacting portion **24** formed at a front end of the body portion **21**, a substantially V-shaped compressible tail portion **23** and a substantially vertical connecting portion **22** connecting with the tail portion **23** and the body portion **21**. Each tail portion **23** has an end portion **231** formed at a free end thereof.

Referring to FIGS. **4** and **6**, the stiffener **3** includes a top wall **311**, a front wall **313** and a pair of side walls **312** shielding the tongue portion **12**. The stiffener **3** defines an opening **3121** extending through the top wall **311** and the side wall **312** for aligning with the first indentation **123**.

In conjunction with FIG. **3**, the shell **4** is substantially case-shaped and includes a top wall **41**, a bottom wall **42** and a pair of side walls **43**. The bottom wall **42** includes a pair of arms **421** projecting upwardly. Each side wall **43** has a latching portion **431** and a latching slot **432** in front of the latching portion **431**.

The grounding member **5** comprises a primary plate **51** and a pair of resisting portions **52** disposed at opposite sides of the primary plate **51** for being pressed against onto a printed circuit board. Each resisting portion **52** has a configuration substantially same to that of the tail portion **23** for being pressed against onto the printed circuit board. Each resisting portions **52** has an end portion **521** formed at a free end thereof.

Referring to FIGS. **1-7**, in assembling of the electrical connector **100**, the terminals **2** are secured in the passageways **121** of the insulative housing **1** and the stiffener **3** is attached to the upper portion of the tongue portion **12** by insert molding. The openings **3121** are respectively aligned with the first indentations **123**. The upper surface and the side surface of the body portion **21** of each outermost terminals **20** are resisted against by the first mold. The upper surfaces and side surfaces of the terminals **2** are resisted against by the second molds. The body portion **21** of each outermost terminal **20** is partly exposed outwardly via the first indentation **123** and the opening **3121** after the removal of the first mold. Two adjacent terminals **2** are exposed outwardly via one corresponding second indentation **124** after the removal of the second mold. The tail portions **23** are disposed below the insulative housing **1** and facing to the body portions **21** for compression mount to a printed circuit board. In details, as showed in the enlarged FIGS. **7**, **7**(A) and **7**(B), the flange **128** forms a protrusion **129** around the corresponding indentation **123**, and the protrusion **129** forms a U-shaped structure with a pair of legs **1291** spaced from each other with a transverse bar **1292** linked therebetween. The protrusion **129** is received within the corresponding opening **3121**. A pair of downward abutment sections **1293** are respectively formed at the ends of the corresponding legs **1291** to commonly abut downwardly against an upward abutment section **3122** of the stiffener **3** around the corresponding opening **3121**.

The insulative housing **1** together with the terminals **2** and the stiffener **3** is enclosed in the shell **4**, with the pair of arms **421** received in the cutouts **111**. The protrusions **114** latches with the latching slots **432**. The latching portions **431** engage with the concaves **113**. The primary plate **51** of the grounding member **5** is welded onto the bottom wall **42** of the shell **4**. In one exemplary use, the connector **100** together with a face plate is mounted through an opening of an electronic device to connect with an internal printed circuit board. In such use, since the end portions **231** of the terminals **2** and the end portions **521** of the grounding member **5**, each shaped as one leg of a substantially V-shaped configuration, press upon the face plate and thus cross over a peripheral wall of the opening, the electrical connector **100** can be readily removed from the electronic device without obstruction of the terminals **2** and/or the grounding member **5**.

Referring to FIG. **8**, in a second embodiment, the flange **128'** defines a third indentation **125'** exposing through the lower surface and the side portion of tongue portion **12'** and communicating with the adjacent passageway **121'** for accommodating a third mold (not shown). The lower surface and the side surface of the body portion **21** of each outermost terminal **20** are resisted against by the third mold, and exposed outwardly via the third indentation **125'** after removal of the third mold. The flange **128'** defines a fourth indentation **126'** exposing through the upper portion, the side portion, and the lower portion of the tongue portion **12'** and communicating with adjacent passageway **121'** for accommodating a fourth mold (not shown) to confine the stiffener **3**. The third and fourth indentations **125'** and **126'** may coexist with the first indentation **123** or be formed alone.

The terminals **2** and the stiffener **3** could be confined at predetermined positions precisely by the first to fourth molds, i.e., through the first to fourth indentations **123**, **124**, **125'**, **126'**. Especially, the outermost terminals **20** are resisted to keep a certain distance away from the side walls **312** of the stiffener **3** by the first mold. Therefore, potential short circuit or fire breaking out caused by close proximity between the outermost terminals **20** and the stiffener **3** is prevented. Additionally, the outermost terminals **20** are separated from the side walls **312** of the stiffener **3** by the flanges **128**, and resisted against by the third molds from approaching the side walls **312** of the stiffener **3**. Therefore, short circuit or fire breaking out caused by the outermost terminals **20** and the stiffener **3** is further prevented.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, and changes may be made in detail, especially in matters of

shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. An electrical connector comprising:

an insulative housing including a base portion and a tongue portion extending forwardly from the base portion, said tongue portion having an upper portion, a lower portion, a pair of side portions, and a plurality of passageways at the lower portion, said tongue portion defining a pair of first indentations each exposing upwardly and through the upper portion and the side portion;

a plurality of terminals including a pair of outermost terminals, each terminal having a body portion secured in the passageways of the insulative housing, a substantially V-shaped compressible tail portion, and a connecting portion connecting with the tail portion and the body portion, said tail portion disposed below the insulative housing and facing the body portions for compression mounting to a printed circuit board; and

a stiffener attached to the upper portion of the tongue portion and defining a pair of openings aligning with the first indentations respectively, said body portion of each outermost terminal having a side surface partly exposed outwardly via the first indentation and the opening.

2. The electrical connector as claimed in claim **1**, wherein said stiffener includes a top wall shielding the upper portion of the tongue portion and a pair of side walls shielding the pair of side portions of the tongue portion, each opening extending through the top wall and the side wall of the stiffener.

3. The electrical connector as claimed in claim **1**, wherein said lower portion of the tongue portion includes a plurality of ribs alternating with the plurality of passageways, said rib having a front end retreated backwardly to form a first recess.

4. The electrical connector as claimed in claim **1**, wherein said upper portion of tongue portion defines a plurality of second indentations staggered with the passageways, each of the body portions of the terminals having an upper surface and a side surface, the upper and side surfaces of every two adjacent terminals partly exposed outwardly via one corresponding second indentation.

5. The electrical connector as claimed in claim **4**, wherein said tongue portion has a pair of flanges at two opposite sides of the lower portion, said plurality of passageways defined between the pair of flanges.

6. The electrical connector as claimed in claim **5**, wherein said flange defines a third indentation opened downwardly and extending through the side portion of the tongue portion, said body portion of each outermost terminal having a lower surface, the lower surface and the side surface of the outermost terminal body portion exposed outwardly.

7. The electrical connector as claimed in claim **6**, wherein said flange defines a fourth indentation exposing through the upper portion, the side portion, and the lower portion of the tongue portion.

8. The electrical connector as claimed in claim **1**, further comprising a shell and a grounding member attached to the shell, the shell including a top wall, a bottom wall, and a pair of side walls and shielding the insulative housing.

9. The electrical connector as claimed in claim **8**, wherein said grounding member comprises a primary plate welded onto the bottom wall of the shell and a pair of resisting portions disposed at two opposite sides of the primary plate, each resisting portion having a configuration substantially the same as that of the tail portion for being compression mounted to the printed circuit board.

10. The electrical connector as claimed in claim **9**, wherein each of the resisting portion and the tail portion comprises an end portion proximate to a bottom wall of the shell.

11. An electrical connector comprising:

an insulative housing including a base portion and a tongue portion extending forwardly from the base portion;

a plurality of terminals each having a contact portion, a body portion secured in the tongue portion, a substantially V-shaped compressible tail portion, and a connecting portion between the tail portion and the body portion, said tail portion disposed below the insulative housing and facing to the body portion for compression mounting to a printed circuit board;

a shell including a top wall, a bottom wall and a pair of side walls and shielding the insulative housing; and

a grounding member comprising a primary plate secured to the bottom wall of the shell and a pair of resisting portions disposed at opposite sides of the primary plate, each resisting portion having a configuration substantially the same as that of the tail portion for being compression mounted to the printed circuit board.

12. The electrical connector as claimed in claim **11**, wherein each of the resisting portion and the tail portion comprises an end portion proximate to a bottom wall of the shell.

13. An electrical connector comprising:

an insulative housing including a base portion and a tongue portion extending forwardly from the base portion, said tongue portion having an upper portion, a lower portion, a pair of side portions, and a plurality of passageways at the lower portion, said tongue portion further defining a plurality of indentations each exposing upwardly and through the upper portion in a vertical direction and alternating with said passageways along a transverse direction perpendicular to said vertical direction;

a plurality of terminals each having a body portion secured in the corresponding passageway of the insulative housing; wherein

the body portion of each of the terminals forms an upper surface and a side surface, and the upper surfaces and the side surfaces of every adjacent two terminals are partly exposed to an exterior via one corresponding indentation which is located between said adjacent two terminals; wherein

said tongue portion has a pair of flanges at two opposite sides of the lower portion, and said plurality of passageways are defined between the pair of flanges; wherein

each of said flanges defines another indentation opened downwardly and extending into the side portion of the tongue portion to expose the body portion of an outermost terminal;

further including a metallic stiffener attached upon the upper portion of the tongue portion, wherein each of said another indentations is exposed, through a corresponding opening of said stiffener, upwardly to said exterior; wherein

each of said flanges defines a protrusion, which is formed around said corresponding another indentation and

defines a U-shaped structure received and surrounded within the corresponding opening in a top view; wherein

said U-shaped structure includes a pair of legs spaced from each other with a transverse bar linked therebetween; wherein

a pair of downward abutment sections are respectively formed at corresponding ends of said pair of legs to commonly abut downwardly against an upward abutment section of the metallic stiffener, wherein said upward abutment section is formed around the corresponding opening of said metallic stiffener.

14. The electrical connector as claimed in claim **13**, further comprising a shell and a grounding member attached to the shell, the shell including a top wall, a bottom wall, and a pair of side walls to shield the insulative housing.

15. The electrical connector as claimed in claim **14**, wherein each terminal comprises a substantially V-shaped compressible tail portion and a connecting portion connecting with the tail portion and the body portion, said tail portion disposed below the insulative housing and facing to the body portions for compression mount to a printed circuit board.

16. The electrical connector as claimed in claim **15**, wherein said grounding member comprises a primary plate welded onto the bottom wall of the shell and a pair of resisting portions disposed at two opposite sides of the primary plate, each resisting portion having a configuration substantially same as that of the tail portion for being compression mounted to the printed circuit board.

* * * * *